



**PATENT APPLICATION**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Toshiyuki KASAI

Group Art Unit: 2629

Application No.: 10/642,740

Examiner: K. XIAO

Filed: August 19, 2003

Docket No.: 116885

For: ELECTRONIC CIRCUIT, ELECTRO-OPTICAL DEVICE, AND ELECTRONIC APPARATUS

**AMENDMENT FILED WITH RCE**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

In reply to the January 19, 2007 Office Action, in conjunction with the Request for Continued Examination (RCE) concurrently filed herewith, please consider the following:

**Amendments to the Claims** as reflected in the listing of claims; and

**Remarks.**

**Amendments to the Claims:**

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An electronic circuit that

sets a gate voltage of a voltage-rising transistor included in a transforming circuit to an initial voltage in order to turn on the voltage-rising transistor,

changes a reference voltage value  $V_{ref}$  ~~with a~~ with the transforming circuit,  $V_{ref}$  being capable of causing a current  $I_o$  to flow through a plurality of  $N$  current-generating active elements if directly applied to the plurality of  $N$  current-generating active elements, the transforming circuit ~~using a~~ using the voltage-rising transistor having a threshold voltage  $V_{thc}$  that is substantially identical to  $V_{th}$ , the voltage-rising transistor being located in physical proximity to the plurality of  $N$  current-generating active elements,  $V_{th}$  being a threshold voltage of one of the plurality of  $N$  current-generating active elements, the transforming circuit establishing a changed reference voltage ( $V_{ref} + V_{thc}$ ) that is capable of causing a current  $I_n$  ( $n=1, 2, \dots, N$ ) to flow through the plurality of  $N$  current-generating active elements,

supplies the changed reference voltage to control terminals of the plurality of  $N$  current-generating active elements,

establishes a conduction state of the plurality of  $N$  current-generating active elements, and

selects, using a plurality of switching transistors, some of the plurality of  $N$  current-generating active elements based on signals and generates a current having a current level corresponding to the signals by superposing currents passing through the current-generating active elements selected by the signal, from among the plurality of  $N$  current-generating active elements.

2. (Currently Amended) An electronic circuit, comprising:

a plurality of N current-generating active elements;

a transforming circuit that generates an applied voltage ( $V_{ref} + V_{thc}$ ) that is applied to control terminals of the plurality of N current-generating active elements by using a threshold voltage  $V_{thc}$  of a voltage-rising transistor that is substantially identical to a threshold voltage  $V_{th}$  of one of the plurality of N current-generating active elements to change a reference voltage  $V_{ref}$ ,  $V_{ref}$  being capable of causing a current  $I_o$  to flow through a plurality of N current-generating active elements if directly applied to the plurality of N current-generating active elements, the voltage-rising transistor being located in physical proximity to the plurality of N current-generating active elements, the applied voltage being capable of causing a current  $I_n$  ( $n=1, 2, \dots, N$ ) to flow through the plurality of N current-generating active elements, and the transforming circuit comprising an initializing device that sets a gate voltage of the voltage-rising transistor included in the transforming circuit to an initial voltage in order to turn on the voltage-rising transistor, and

selection transistors connected in series to each of the plurality of the N current-generating active elements.

a current having a current level corresponding to signals being generated by superposing the currents that pass through a selection transistor in which an ON-state is selected, among the selection transistors, based on the signals and the current-generating active elements connected in series to the selected selection transistor from among the plurality of N current-generating active elements.

3. (Currently Amended) The electronic circuit according to Claim 1, the transforming circuit comprising a compensating voltage-rising transistor that reduces reducing the reference voltage value by a predetermined value or that adds adding a predetermined value to the reference voltage value.

4. (Previously Presented) The electronic circuit according to Claim 1, each of the plurality of current-generating active elements including at least one transistor.

5. (Previously Presented) The electronic circuit according to Claim 1, the plurality of current-generating active elements being connected in parallel to each other.

6. (Previously Presented) The electronic circuit according to Claim 3, each of the plurality of current-generating active elements comprising one current generating transistor and the current generating transistors having different gain factors from each other.

7. (Previously Presented) The electronic circuit according to Claim 3, at least one current-generating active element from among the plurality of the current-generating active elements being connected in series to a unit transistor.

8. (Currently Amended) The electronic circuit according to Claim 7, the ~~compensating~~voltage-rising transistor being a transistor having a characteristic equal to that of the unit transistor.

9. (Currently Amended) The electronic circuit according to Claim 6, the current generating transistors and the ~~compensating~~voltage-rising transistor being formed at positions adjacent to each other and have the same threshold voltage value.

10. (Canceled)

11. (Previously Presented) The electronic circuit according to Claim 1, the transforming circuit comprising a voltage-stabilizing device.

12. (Previously Presented) The electronic circuit according to Claim 11, the voltage-stabilizing device comprising capacitors.

13. (Currently Amended) An electro-optical device, comprising:  
a control circuit that outputs digital luminance gradation data;

a driving circuit that sets a gate voltage of a voltage-rising transistor included in a transforming circuit to an initial voltage in order to turn on the voltage-rising transistor and generates an analog driving signal based on the digital luminance gradation data; and

a pixel circuit that drives an electro-optical element based on the analog driving signal,

the driving circuit using a threshold voltage  $V_{thc}$  ~~of a~~ of the voltage-rising transistor substantially identical to a threshold voltage  $V_{th}$  of one of a plurality of current-generating active elements to change a reference voltage value  $V_{ref}$  with a converting circuit to supply a changed reference voltage  $V_{ref} + V_{thc}$  to control terminals of the plurality of current-generating active elements and to establish a conduction state in the plurality of current-generating active elements,  $V_{ref}$  being capable of causing a current  $I_o$  to flow through the plurality of current-generating active elements if directly applied to the plurality of current-generating active elements, the voltage-rising transistor being located in physical proximity to the plurality of current-generating active elements, the changed reference voltage being capable of causing a current  $I_n$  ( $n=1, 2, \dots, N$ ) to flow through the plurality of current-generating active elements; and selecting, using a plurality of switching transistors, some of the plurality of current-generating active elements based on the digital luminance gradation data, and superposing currents that pass through an current-generating active elements selected by the digital luminance gradation data, from among the plurality of current-generating active elements, to thereby generate an analog driving signal having a current level corresponding to the digital luminance gradation data.

14. (Currently Amended) An electro-optical device, comprising:

a control circuit that outputs digital luminance gradation data;

a driving circuit that generates an analog driving signal based on the digital luminance gradation data; and

a pixel circuit that drives a current driving element based on the analog driving signal,

the driving circuit comprising a plurality of current-generating active elements; a transforming circuit that generates an applied voltage ( $V_{ref} + V_{thc}$ ) which is applied to control terminals of the plurality of current-generating active elements by using a threshold voltage  $V_{thc}$  of a voltage-rising transistor that is substantially identical to a threshold voltage  $V_{th}$  of one of the plurality of current-generating active elements to change a reference voltage  $V_{ref}$ ,  $V_{ref}$  being capable of causing a current  $I_o$  to flow through the plurality of current-generating active elements if directly applied to the plurality of current-generating active elements, the voltage-rising transistor being located in physical proximity to the plurality of current-generating active elements, the applied voltage being capable of causing a current  $I_n$  ( $n=1, 2, \dots, N$ ) to flow through the plurality of current-generating active elements; and selection transistors connected in series to each of the plurality of current-generating active elements, the transforming circuit comprising an initializing device that sets a gate voltage of the voltage-rising transistor included in the transforming circuit to an initial voltage in order to turn on the voltage-rising transistor, and

a current having a current level corresponding to said digital luminance gradation data being generated by superposing the currents that pass through a selection transistor in which an ON-state is selected, from among the selection transistors, based on the signal and the current-generating active elements connected in series to the selected selection transistor from among the plurality of current-generating active elements.

15. (Currently Amended) The electro-optical device according to Claim 14, the ~~transforming circuit comprising a compensating voltage-rising transistor that reduces~~ reducing the reference voltage value by a predetermined value or that adds adding a predetermined value to the reference voltage value.

16. (Previously Presented) The electro-optical device according to Claim 13, each of the plurality of current-generating active elements comprising at least one transistor.

17. (Previously Presented) The electro-optical device according to Claim 13, the plurality of current-generating active elements being connected in parallel to each other.

18. (Previously Presented) The electro-optical device according to Claim 15, each of the plurality of the current-generating active elements comprising a current generating transistor, and the current generating transistors having different gain factors from each other.

19. (Previously Presented) The electro-optical device according to Claim 15, at least one of the plurality of current-generating active elements being connected in series to a unit transistor.

20. (Currently Amended) The electro-optical device according to Claim 19, the ~~compensating voltage-rising~~ transistor being a transistor having a characteristic equal to that of the unit transistor.

21. (Currently Amended) The electro-optical device according to Claim 18, the current generating transistors and the ~~compensating voltage-rising~~ transistor being formed at positions adjacent to each other, and have the same threshold value voltage.

22. (Canceled)

23. (Previously Presented) The electro-optical device according to Claim 14, the transforming circuit comprising a voltage-stabilizing device.

24. (Previously Presented) The electro-optical device according to Claim 23, the voltage-stabilizing device comprising capacitors.

25. (Previously Presented) The electro-optical device according to Claim 13, the electro-optical element being an electroluminescent (EL) element.

26. (Previously Presented) The electro-optical device according to Claim 25, the EL element comprising a light-emitting layer made up of organic materials.

27. (Previously Presented) An electronic apparatus packaged with the electronic circuit according to Claim 1.

28. (Previously Presented) An electronic apparatus packaged with the electro-optical device according to Claim 13.

29. (Previously Presented) The electronic circuit as set forth in Claim 7, at least one current generating active element of the plurality of current generating active elements having a parallel connection to the unit transistor.

30. (Previously Presented) The electro-optical device as set forth in claim 19, at least one current generating active element of the plurality of current generating active elements having a parallel connection to the unit transistor.

31-34. (Canceled)

35. (New) The electronic circuit according to claim 1, the initial voltage being set by connecting the gate of the voltage-rising transistor to an initial set power source via a switch.

36. (New) The electronic circuit according to claim 2, the initial voltage being set by connecting the gate of the voltage-rising transistor to an initial set power source via a switch.

37. (New) The electro-optical device according to claim 13, the initial voltage being set by connecting the gate of the voltage-rising transistor to an initial set power source via a switch.

38. (New) The electro-optical device according to claim 14, the initial voltage being set by connecting the gate of the voltage-rising transistor to an initial set power source via a switch.